UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/708,943	04/02/2004	Long-Hui Lin	LKSP0028USA	2942

27765 7590 06/20/2008

NORTH AMERICA INTELLECTUAL PROPERTY CORPORATION
P.O. BOX 506
MERRIFIELD, VA 22116

EXAMINER	
TSAI, CAROL S W	

ART UNIT	PAPER NUMBER
2857	

NOTIFICATION DATE	DELIVERY MODE
06/20/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

winstonhsu.uspto@gmail.com
Patent.admin.uspto.Rcv@naipo.com
mis.ap.uspto@naipo.com.tw

Office Action Summary	Application No.	Applicant(s)	
	10/708,943	LIN, LONG-HUI	
	Examiner	Art Unit	
	CAROL S. TSAI	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 May 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see "REMARKS/ARGUMENTS", filed May 21, 2008, with respect to claims 1-12 have been fully considered and are persuasive. The finality of the previous office action is hereby withdrawn in view of the newly cited prior art U. S. Patent No. 6,516,433 to Koenig.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent No. 6,516,433 to Koenig.

4. Koenig discloses a method of defect root cause analysis (see col. 2, lines 19-21 and col. 3, lines 12-13) comprising following steps: providing a die (a faulty chip 10b shown on Fig. 2) (see Abstract, lines 1-2; col. 1, lines 7-9; and col. 3, lines 12-13) being processed through a plurality of semiconductor processes (see col. 2, lines 19-23 and lines 36-37 and col. 3, lines 19-25), wherein the die comprises a plurality of defects (see Fig. 2; col. 1, lines 9-11; col. 2, lines 14-15 and lines 58-60; and col. 3, lines 5-6); dividing the defects into three defect types comprising a first defect type, a second

defect type, and a third defect type according to their sizes and locations (see col. 2, lines 58-62); performing a defect inspection to detect sizes and locations of the plurality of defects; using three methods to perform performing a chemical state analysis_ corresponding to each defect type respectively of the single die (see col. 3 lines 45-53); performing a mapping analysis according to a result of the chemical state analysis (see col. 2, lines 27-30 and col. 4, lines 2-7), wherein the mapping analysis comprises: forming the defects of the-single die into a defect pattern (see col. 2, lines 43-45); and comparing the defect pattern with a predetermined pattern on the-single die (see col. 2, lines 48-52 and col. 4, lines 7-9); analyzing the root cause of the defects according to the comparison between the defect pattern and the predetermined pattern on the die for determining the semiconductor process causing the defect (see col. 4, lines 9-30).

5. Koenig does not disclose expressly modifying the semiconductor process causing the defects to reduce the number of defects in the die.

6. It is, however, considered inherent that Koenig modifies the semiconductor process causing the defects to reduce the number of defects in the die (see col. 1, lines 26-40; col. 2, lines 16-18 and lines 62-64; and col. 6, lines 9-15), because such modifying is known to be a necessary step in order that defects in the die can be decreased and yield rate of a product line can be improved for a semiconductor factory.

7. As to claim 3, Koenig also discloses an auger analysis is performed in the chemical state analysis when the defects are smaller than 0.2 .mu.m or are not single phase particles (see col. 4, lines 46-47).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 4, 7, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 6,516,433 to Koenig in view of U. S. Patent No. 6,777,677 to Nozoe et al.

10. As noted above, Koenig discloses the claimed invention, except for the auger analysis utilized a scanning auger microscopy (SAM) or an auger electron spectroscopy (AES) to perform the chemical state analysis of the sample.

11. Nozoe et al. teach for the auger analysis utilized a scanning auger microscopy (SAM) or an auger electron spectroscopy (AES) to perform the chemical state analysis of the sample (see col. 10, lines 1-16).

12. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Koenig's method to include for the auger analysis utilized a scanning auger microscopy (SAM) or an auger electron spectroscopy (AES) to perform the chemical state analysis of the sample of the die, as taught by Nozoe et al., in order that element composition of the predetermined area with the auger electron spectrum AES analysis system can be analyzed.

13. As to claims 7 and 8, Koenig disclose a method of defect root cause analysis (see col. 2, lines 19-21 and col. 3, lines 12-13) comprising following steps: providing a

die (a faulty chip 10b shown on Fig. 2) (see Abstract, lines 1-2; col. 1, lines 7-9; and col. 3, lines 12-13) being processed through a plurality of semiconductor processes (see col. 2, lines 19-23 and lines 36-37 and col. 3, lines 19-25), wherein the die comprises a plurality of defects (see Fig. 2; col. 1, lines 9-11; col. 2, lines 14-15 and lines 58-60; and col. 3, lines 5-6); performing a mapping analysis according to a result of the chemical state analysis (see col. 2, lines 27-30 and col. 4, lines 2-7), wherein the mapping analysis comprises: forming the defects into a defect pattern (see col. 2, lines 27-30 and col. 4, lines 2-7); and comparing the defect pattern with a predetermined pattern on the die (see col. 2, lines 48-52 and col. 4, lines 7-9); judging a root cause of the defect generation according to the comparison between the defect pattern and the predetermined pattern on the single die for determining the semiconductor process causing the defect see col. 4, lines 9-30).

14. Koenig does not disclose expressly modifying the semiconductor process causing the defects to reduce the number of defects in the die.

15. It is, however, considered inherent that Koenig modifies the semiconductor process causing the defects to reduce the number of defects in the die (see col. 1, lines 26-40; col. 2, lines 16-18 and lines 62-64; and col. 6, lines 9-15), because such modifying is known to be a necessary step in order that defects in the die can be decreased and yield rate of a product line can be improved for a semiconductor factory.

16. Koenig does not disclose performing a voltage contrast to identify locations of the defects; cutting the die with a focus ion beam (FIB) to expose a cross-section of the,

die; utilizing auger electrons to perform a chemical state analysis of the cross-section of the die.

17. Nozoe et al. teach performing a voltage contrast to identify locations of the defects (see col. 4, lines 49-65).

18. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Koenig's method to include performing a voltage contrast to identify locations of the defects, as taught by Nozoe et al., in order that electrical defects through the voltage contrast can be reviewed.

19. Nozoe et al. teach cutting the die with a focus ion beam (FIB) to expose a cross-section of the die (see col. 9, line 66 to col. 7, line 1).

20. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Koenig's method to include cutting the die with a focus ion beam (FIB) to expose a cross-section of the, die, as taught by Nozoe et al., in order that the cross-section observation mode can utilize a focus ion beam (FIB) to cut and trim the sample for a more precise observation.

21. Nozoe et al. teach utilizing auger electrons to perform a chemical state analysis of the cross-section of the die (see col. 10, lines 1-16).

22. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Koenig's method to include utilizing auger electrons to perform a chemical state analysis of the cross-section of the die, as taught by Nozoe et al., in order that element composition of the predetermined area with the auger electron spectrum AES analysis system can be analyzed.

23. As to claim12, Koenig also discloses an auger analysis is performed in the chemical state analysis when the defects are smaller than 0.2 μm or are not single phase particles (see col. 4, lines 46-47).

24. Claims 2, 5, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koenig in view of U. S. Patent No. 5,847,821 to Tracy et al.

25. As noted above, Koenig disclose the claimed invention, except for performing a defect classification after finishing the defect inspection for judging a defect type of the defects and performing a corresponding chemical state analysis according to the defect type of the defects.

26. Tracy et al. teach performing a defect classification after finishing the defect inspection for judging a defect type of the defects and performing a corresponding chemical state analysis according to the defect type of the defects (see col. 6, lines 44-48).

27. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Koenig method to include performing a defect classification after finishing the defect inspection for judging a defect type of the defects and performing a corresponding chemical state analysis according to the defect type of the defects, as taught by Tracy et al., in order that various types of defects can be classified.

28. As noted to claims 5 and 11, Koenig does not disclose an energy dispersive spectrometer (EDS) is utilized to detect in the chemical state analysis when the defects are equal to or larger than 0.2 μm, single phase, or thick particles.

29. Tracy et al. teach an energy dispersive spectrometer (EDS) is utilized to detect in the chemical state analysis when the defects are equal to or larger than 0.2 μm, single phase, or thick particles (see col. 1, lines 54-66).

30. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Koenig's method to include an energy dispersive spectrometer (EDS) is utilized to detect in the chemical state analysis when the defects are equal to or larger than 0.2 μm, single phase, or thick particles, as taught by Tracy et al., in order to measure the morphology and chemical composition of particles.

31. Claims 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koenig in view of U. S. Patent No. 5,561,293 to Peng et al.

32. As noted above, Koenig discloses the claimed invention, except for the chemical state analysis comprises a point scan analysis, delayer analysis, and depth profile analysis.

33. Peng et al. teach the chemical state analysis comprises a point scan analysis, delayer analysis, and depth profile analysis (see col. 4, lines 37-44).

34. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Koenig's method to include the chemical state analysis comprises a point scan analysis, delayer analysis, and depth profile analysis, as taught

by Peng et al., in order to identify the material at the location of interest and may provide a determination of the cause of the failure (see col. 5, lines 9-11).

35. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koenig in view of U. S. Publication 2003/0208731 to Miwa.

36. As noted above, Koenig discloses the claimed invention, except for defects located on an underlayer of the die.

37. Miwa teaches defects located on an underlayer of the die (see paragraph 0124).

38. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Koenig's method to include defects located on an underlayer of the die, as taught by Miwa, in order that serious underlayer loss due to the longer over-etching time that is required to compensate for thickness differences within the wafer can be reduced.

Conclusion

39. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

40. Gao et al. disclose methods and apparatus for efficiently setting up and maintaining a defect classification system.

41. Lensing et al. disclose a method and apparatus for determining a root cause of a fault.

42. Tsou et al. disclose a method of preparing a test sample for electron microscopy analysis.

43. Dotan et al. disclose a method and system for automatic EDX analysis of defects quantitatively take into consideration x-ray signals attributable to the background.

44. Kulkarni et al. disclose techniques for improving manufacturing process control based on inspection of manufactured items at intermediate process steps, based on clustering and binning of defect data.

Contact Information

45. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CAROL S. TSAI whose telephone number is (571)272-2224. The examiner can normally be reached on M-F (8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ramos-Feliciano S. Eliseo can be reached on (571) 272-7925. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

June 16, 2008
Art Unit 2857
/Carol S Tsai/
Primary Examiner, Art Unit 2857